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NUTRITION AND *IN VITRO* DIGESTIBILITY OF TALL FESCUE FOR WHITE-TAILED DEER, MAY THROUGH NOVEMBER

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ABSTRACT.—Describes a study of the nutritive quality and digestibility of fertilized and unfertilized tall fescue in spring, summer, and fall. The grass may be most valuable as food in early spring and late fall, and on unfertilized sites.

OXFORD: 268.3:149.6 CERVID. KEY WORDS: range, wildlife, food habits, wild ruminants, *Odocoileus virginianus*, forage quality.

Conversion of low-quality hardwood forest to tall fescue (*Festuca arundinacea* Schreb.) grassland (fig. 1) in the Ozarks is producing different food and cover conditions for the resident white-tailed deer (*Odocoileus virginianus*) population. Resource managers are concerned about the impacts of this conversion on wildlife populations and question the contribution of this process to the life requirements of deer. Deer have been known to utilize tall fescue, a cool season perennial grass, because animals collected in converted areas during the November hunting season sometimes have fescue in their rumens. Also, Short and Segelquist (1975) have found Elbon rye (*Secale cereale* L.), a cool season annual grass, to be heavily used by deer when available.

The present study was designed to examine the nutritive quality and digestibility of fertilized and unfertilized tall fescue with respect to use in late spring, summer, and fall, when it is most abundant.

Figure 1. — *A typical converted area. Number board is 24 inches tall.*

METHODS

Forage samples were collected from fertilized and unfertilized fescue stands during May, July, September, and November. Collection sites were upper north- and south-facing slopes located in the White River basin of southern Missouri. Forage samples were clipped to a 2-inch stubble, ovendried at 70C using a 2-mm screen to provide samples for chemical analysis and *in vitro* digestibility trials. Percents of crude protein, calcium, phosphorus, and acid detergent fiber were determined by the Agricultural Experiment Station Chemical Laboratories, University of Missouri, Columbia. *In vitro* digestion trials were performed by the ARS-University of Missouri facilities using the two-stage technique of Tilley and Terry (1963).

Deer rumen fluid samples were collected through the assistance of the Missouri Department of Conservation research personnel, Columbia, Missouri. Captive animals were maintained on a diet similar to that described by Snider and Asplund (1974). Rumen fluid samples were transported to the laboratory in sealed, insulated containers; inoculation of forage samples began within 2 hours after collection.

The experimental design was a three-factor factorial with two levels of fertilizer (0 and 48 pounds/acre, N, P, K), two aspects (north and south) with two plots on each aspect, and four harvest dates. All data were subjected to standard analysis of variance procedures. Statements of significance are based on this analysis; significant effects were further subjected to Duncan's New Multiple Range Test at the 5 percent level.

RESULTS AND DISCUSSION

Fescue in May had a crude protein content of 16.2 percent (table 1)—a value higher than the 13 percent Murphy and Coates (1966) determined as adequate for reproduction and close to the 16.8 percent protein figure which McEwen *et al.* (1957) cited as yielding good growth and antler production. Protein in fescue declined in July to 9.1 percent and remained at about that level in September (9.3) and November (9.5). These values are comparable to the 9 to 10 percent ratio used by McEwen *et al.* (1957) to obtain some growth but retarded antler development. Protein level in fescue during the summer is below the 15.0 percent average found for the preferred native summer foods of Missouri deer (Torgerson and Pfander 1971). Protein did not vary significantly with respect to fertilizer treatment or aspect.

Table 1. — *Mean nutritive values and dry matter digestibility of tall fescue forage by harvest date*

Harvest date	Protein	Ca	P	Ratio of Ca/P	ADF[1]	DMD[2]
	- - - *Percent* - - -				- *Percent* -	
May	16.2	0.31	0.29	1.13	30.7	61.3
July	9.1	.43	.21	2.31	35.2	51.4
September	9.3	.36	.26	1.53	37.5	50.9
November	9.5	.29	.25	1.28	31.0	55.9

[1]ADF-acid detergent fiber.
[2]DMD-dry matter digestibility.

Calcium and phosphorus levels (table 1) are considerably lower than the 0.64 and 0.56 percent respectively maintained by McEwen *et al.* (1957) in an ideally complete ration. Our values are closer to what they considered to be the winter minimum of 0.30 percent for these minerals. The calcium levels varied from 0.31 percent in May to 0.43 percent in July, 0.36 percent in September, and 0.29 percent in November. This was considerably below the 1.95 percent average found for the preferred summer foods of Missouri deer (Torgerson and Pfander 1971). Fescue phosphorus levels varied little from those of the preferred summer deer foods.

When fertilizer was applied, calcium content of fescue increased on the north slopes but decreased on the south slopes.

Phosphorus levels attained the minimum of 0.30 percent recommended by McEwen *et al.* (1957) only on the fertilized plots. The average phosphorus content over the sampling period was 0.29 percent in May, 0.21 percent in July, 0.26 percent in September, and 0.25 percent in November.

The Ca/P ratio exhibited a significant response to both date of harvest and fertilizer treatment. All values of the ratio remained close to or within the acceptable limits (2:1 to 1:2) for ruminant animals (Maynard and Loosli 1962). Ca/P ratio varied over the sample period from 1.13 in May to 2.31 in July, 1.53 in September, and 1.28 by November. Samples from fertilized plots had a Ca/P ratio of 1.19, while samples from unfertilized plots had a Ca/P ratio of 1.93.

Fiber content (table 1) did not change appreciably over the sampling period: acid-detergent fiber values were 30.7 percent in May, 35.2 percent and 37.5 percent for the mature forage of July and September respectively, and 31.0 percent for the fall growth accumulated to November. There were no significant differences due to fertilizer or aspect; however, there was an interaction (fig. 2) between harvest date and fertilizer treatment because samples from fertilized plots contained lower amounts of fiber initially. The fiber content increased

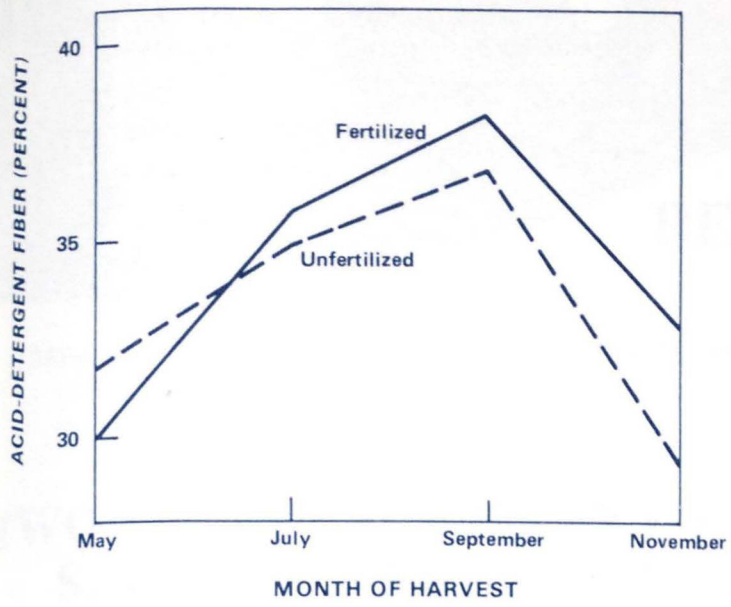

Figure 2. – *Graph of the interaction between fertilizer treatments for acid-detergent fiber.*

after the first sample date thus unfertilized samples contained less fiber for the remainder of the sampling period. This effect may be a result of increased growth due to fertilizer application.

Dry matter digestibility coefficients (table 1) varied as the fescue developed throughout the season, dropping from 61.3 percent in May to 51.4 percent in July, to 50.9 percent in September, and rising up to 55.9 percent for November. Fertilizer treatment significantly influenced dry matter digestibility. Samples from fertilized plots had a coefficient of 53.2 and those from unfertilized plots 56.6. This difference seems due to the ranker growth and increased fiber production which may have resulted from fertilization.

Tall fescue is not an important spring or summer deer food in Missouri according to Korschgen *et al.* (1976). They found fescue in only 34 of 304 Ozark deer stomachs during spring and summer and it contributed only 0.2 percent of the total food volume. The widespread availability of fescue and low consumption indicates low palatability for deer from April through September. But when eaten, fescue is above average in digestibility. Digestibility coefficients in this study were higher than the average of 47.9 percent found for preferred summer foods of Missouri deer (Snider and Asplund 1974). Fescue does have less crude protein and calcium than preferred summer deer foods. Tall fescue as a food source for deer may be most valuable in early spring, late fall, or both, and on unfertilized areas, because fescue on these areas was higher in dry matter digestibility.

SUMMARY

1. Harvest date and fertilizer treatment have more effect on nutritive value and digestibility of fescue than exposure.

2. Protein, acid-detergent fiber, and dry matter digestibility were at the most desirable levels early and late in the sampling period. Calcium and phosphorus were very low throughout the study. The calcium-phosphorus ratio did not appear to be limiting, however.

3. Acid-detergent fiber and dry matter digestibility values for unfertilized samples were superior to the values for fertilized samples.

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